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Quantifying the contribution of different cloud types to the radiation budget in southern West Africa during the monsoon season

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The contribution of cloud to the radiation budget of southern West Africa (SWA) during the June-September monsoon season is poorly understood. Reasons for this include a lack of surface based cloud and radiation observations, uncertainty surrounding the aerosol and cloud data required for calculations of the cloud radiative effect, and infrequent clear-sky scenes that are required to estimate the top of atmosphere cloud radiative effect. An improved understanding of the contribution of cloud to the radiation budget of SWA is vital both for understanding how cloud effects the regional energy budget and for evaluation and improvement of climate models which have large radiation errors in this region.

To this end, we calculate cloud radiative effects for SWA using the SOCRATES (Suite Of Community Radiative Transfer codes based on Edwards-Slingo) broadband radiative transfer scheme. We use CCCM (collocated CERES-CloudSat-CALIPSO-MODIS) data as input to radiation calculations, which we validate against coincident CERES measurements. During the monsoon season, a wide range of cloud types can be found in SWA and the radiation calculations allow us to identify multiple cloud types within a CERES footprint and thus calculate separate cloud radiative effects for each cloud type. We use these calculations to identify which cloud types are most important to the radiation and consequently energy budget of SWA.